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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
VANNUCCI, JAMES	
ART UNIT	**PAPER NUMBER**
2828	

DATE MAILED: 04/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/636,103	LEE ET AL.	
	Examiner	Art Unit	
	Jim Vannucci	2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 07 August 2003.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-45 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-6,10,11,15-24,26-28,30-34,37-41 and 45 is/are rejected.

7)☒ Claim(s) 7-9,12-14,25,29,35,36 and 42-44 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 07 August 2003 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 26 is objected to because of the following informalities: it appears "we-etching" is spelled incorrectly. Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-6, 11, 15, 17-24, 26-28, 31, 33 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hwang et al.(6,638,773) in view of Mizutani et al.(5,878,066).

Claim 1, figure 1 of Hwang discloses a single-wavelength distributed feedback laser structure having an active-material layer(120) for generating a laser light having a wavelength in a specific range, two cladding layers(113 & 132) respectively covering an upper and a bottom sides of the active-material layer(120) for forming a waveguide structure, and a grating layer(141 & 143) having a specific period for determining an illuminating wavelength.

Hwang does not disclose a phase shift layer

Figure 10A of Mizutani discloses two sections with a phase shift layer(1019 & 1020) having a specific thickness for controlling a difference between Bragg wavelengths of the two sections(col. 16, lines 26-36), and a wet-etching stop layer(Hwang fig. 3, no. 145) positioned between an active-material layer(1015) and the phase shift layer(1019 & 1020) where a difference between the two sections is the existence of the phase shift layer that causes a difference in the effective refractive indices between the two sections so as to generate a fixed difference between Bragg wavelengths of the two sections(col. 16, lines 19-22).

Claims 2 and 20, the laser disclosed in both references is fabricated on a same wafer.

Claims 3 and 21, Hwang discloses the active-material layer and the two cladding layers being formed through a single expitaxial growth step(col. 7, lines 31-50).

Claims 4 and 22, Hwang discloses the active-material being a multiple quantum well (MQW) layer(col. 1, lines 50-52).

Claims 5 and 23, the two cladding layers(132 & 113) disclosed in Hwang are separate confinement hetero-structure layers.

Claims 6 and 24, Hwang discloses forming the grating layer on the laser by cooperating a single holographic exposure with a dry etching or a wet etching(col. 14, lines 29-51).

Claim 11, figure 10A of Mizutani discloses a laser structure with an anti-reflection layer(1041) on two end-facets for avoiding a mode stability influenced by reflection.

Claim 15, figure 10A of Mizutani discloses a laser structure that has coatings(1041) on two end-facets for providing proper reflection to alter performance.

Claim 17, figure 14A of Mitzutani discloses two electrodes(1033 & 1043) applied on two sections that can be used for altering a phase relationship between the two sections so as to stabilize an output mode of the laser structure through adjusting a current of the two electrodes(col. 18).

Claim 18, figure 14A of Mitzutani discloses two electrodes(1033 & 1043) applied on two sections for altering an output wavelength of the laser structure to form a tunable laser through adjusting a current of the two electrodes(col. 18).

Claim 19, a single-wavelength distributed feedback laser structure having two sections with an active-material layer for generating laser light, two cladding layers respectively covering an upper and a bottom sides of the active-material layer for forming a waveguide structure, and a sampled grating layer having a specific period for determining a lasing wavelength are disclosed as referenced above. Hwang also discloses a grating that is not uniform over the cavity length(col. 4, lines 8-10). This non-uniformity would produce a difference between the duty cycles of the two sections of the sampled grating layer. The different duty cycles would causes a different effective refractive index for the two sections so as to generate a fixed difference between Bragg wavelengths of the two sections.

Claim 26, the wet etching stop layer(145) disclosed in figure 3A of Hwang is positioned between the active-material layer(120) and the sampled grating layer(345) for facilitating the wet etching.

Claim 27, the grating layer duty cycle disclosed in Hwang is a proportion occupied by a grating in a sampling period.

Claim 28, different duty cycles(Hwang) for the two sections disclosed in figure 10A of Mizutani would change the effective distributed feedback value and would cooperate with the specific lengths of the two sections causing different refractances for the two sections so as to have an identical effect to a structural asyrnmetry.

Claim 31, the duty cycle of the sampled grating layer(1021) disclosed in figure 10A of Mizutani is 100% on one of the two sections.

Claim 33, a plurality of sections is disclosed in figure 10A of Mizutani and Hwang discloses a non-uniform grating over the length of the cavity that would result in different duty cycles combined at an arbitrary sequence.

Claim 45, Mizutani discloses additionally growing a phase shift layer when said laser is firstly processed by a basic structural epitaxy, and removing a portion of said phase shift layer which is above one of said two sections through a wet etching(Hwang) before a holographic exposure is processed for forming a grating, wherein a wet-etching stop layer(Hwang) is formed between said laser and said phase shift layer for facilitating said wet-etching.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the above elements disclosed in Mizutani with the device disclosed in Hwang to produce an improved lasing device and to produce a difference in the effective refractive indices of the two sections as disclosed in Mizutani.

4. Claims 10, 30, 32, 34 and 37-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hillmer et al.(6,208,793) in view of Hwang as applied above, and further in view of Mizutani.

Hwang and Mizutani do not disclose the following elements.

Claim 10, figure 1 of Hillmer discloses two sections(either side of gap no. 6) that have different longitudinal lengths for forming a structural asymmetry and when the fixed difference is getting larger, the asymmetry is getting larger.

Claim 30, figure 1 of Hillmer discloses two sections have different sampling periods(4).

Claim 32, figure 1 of Hillmer discloses a laser structure with plural sections having different sampling periods combined at an arbitrary sequence(4).

Claim 34, figure 1 of Hillmer discloses a duty cycle of a sampled grating layer that is gradually decreased or increased from one end of the laser structure to the other end(4).

It would have been obvious to incorporate these elements into the device disclosed in Hwang and Mitzutani to improve the tuning of the device as disclosed in Hillmer(abstract).

Claim 37, figure 1 of Hillmer discloses a multi-wavelength distributed feedback laser array.

Hwang and Mizutani disclose a laser that could be used in an array with two sections having an active-material layer for generating a laser having a wavelength in a specific range, two cladding layers respectively covering an upper and a bottom sides of

the active-material layer for forming a waveguide structure, a phase shift layer having a specific thickness for controlling a difference between Bragg wavelengths of the two sections, a wet-etching stop layer positioned between the active-material layer and the phase shift layer, and a sampled grating layer having a specific grating period and a specific sampling period for determining an illuminating wavelength where a difference between the two sections is the existence of the phase shift layer causing a difference of the effective refractive indices between the two sections so as to generate a fixed difference between Bragg wavelengths of the two sections.

Figure 1 of Hillmer discloses aligning laser elements so the peak of the reflection spectrum of each laser element is aligned to different positions so as to output different wavelengths.

Claim 38, the laser array disclosed in figure 1 of Hillmer is fabricated on a same wafer.

Claim 39, Hwang discloses the active-material layer and the two cladding layers could be formed through a single expitaxial growth step.

Claim 40, Hwang discloses that the sampled grating layer could be formed on the laser by cooperating a single holographic exposure with a dry etching or a wet etching.

Claim 41, figure 11 of Mitsutani discloses a sampled grating layer with a reflection spectrum with plural equidistant peaks whose center peak is aligned to a Bragg wavelength and figure 1 of Hillmer discloses two sections that have different sampling periods so as to obtain a reflection peak difference delta P.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the above referenced combinations to form a device with improved yield as disclosed in Hwang and with a difference between effective refractive indices between sections as disclosed in Mizutani.

Allowable Subject Matter

5. Claims 7-9, 12-14, 25, 29, 35-36 and 42-44 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. The following is a statement of reasons for the indication of allowable subject matter. The following limitations are primarily responsible for distinguishing these claims over the prior art.

Regarding claims 7-9 and 25, the limitations concerning before said grating layer is formed by said holographic exposure, a portion of said phase shift layer on one of said two sections is removed by said wet etching; regarding claim 12, the limitation concerning said wet-etching stop layer and said grating layer cooperate with each other for controlling a coupling index of said grating layer; regarding claim 13, the limitation concerning said grating layer is located below said active-material layer so that said phase shift layer is located between said grating layer and said active-material layer, and apportion of said phase shift layer located on one of said two sections is removed before growing said active-material layer; regarding claim 14, the limitations concerning said grating layer is located above said active-material layer so that said phase shift

layer is located above said grating layer; regarding claim 16, the limitations concerning said laser structure has asymmetric thin film coatings at two end-facets thereof for further destroying a mode symmetry and because a mode-selection of said laser structure is influenced and said illuminating wavelength is randomly arranged at long wavelength mode or a low wavelength mode, a variation of said wavelength is approximately equal to a width of the stop-band; regarding claim 29, the limitation concerning as the fixed difference becomes larger, a structural asymmetry becomes bigger so as to facilitate a mode-selection; regarding claim 35, the limitations concerning the two sections being made of laser materials which are fabricated through a selective area growth technique for causing a slight difference of the laser materials of the two sections so as to obtain the fixed difference; regarding claim 36, the limitations concerning the two sections being made of laser materials which are altered by a quantum well intermixing after an expitaxy of said active material for causing a slight difference of said laser materials of said two sections so as to obtain said fixed difference; r Regarding claim 42, the limitations concerning said specific thickness of said phase shift layer is properly formed so that said fixed difference of Bragg wavelengths of said two sections is approximately equal to said delta P plus a fixed wavelength so as to cause said reflection spectrums of said two sections to be approximately aligned at the first peak thereof, a length ratio of said two sections is adjusted so that said each laser element illuminates in an aligned reflection spectrum at a long wavelength mode or a short wavelength mode for forming a single-wavelength output, and then said sampling period of said each laser element in said laser array is

formed to be different from one another for aligning said reflection spectrum of said each laser to different locations so that said each laser element outputs different wavelengths; regarding claim 43, the limitations concerning said fixed difference of Bragg wavelengths of said two sections in a portion of said laser array is equal to or larger than two times of said delta P, and a length ratio of said two sections is adjusted so that said each laser element illuminates in an aligned reflection spectrum at a long wavelength mode or a short wavelength mode; and regarding claim 44, the limitations concerning said grating of said each laser element is one of a loss coupled grating, a gain coupled grating, and a complex-coupled grating for generating a single-wavelength output, said specific thickness of said shift layer is formed so that said fixed difference of Bragg wavelengths of said two sections is approximately equal to said delta P plus a fixed wavelength so as to cause said reflection spectrums of said two sections to be approximately aligned at the first peak thereof, and said two sections have an identical length thereof.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Coleman et al.(6,728,290) and Li et al.(5,536,085) disclose many of the limitations recited in the claims of this application.

Correspondence

8. Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Examiner Jim Vannucci whose phone number is (571) 272-1820.

Any inquiry of a general nature or relating to the status of this application should be directed to the Technology Center whose telephone number is (703) 308-0956.

Papers related to Technology Center 2800 applications only may be submitted to Technology Center 2800 by facsimile transmission. Any transmission not to be considered an official response must be clearly marked "DRAFT". The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Technology Center Fax Center number is (703) 872-9306.

James Vannucci

James Vannucci